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CHARACTERIZATION OF DISSOLVED ORGANIC CARBON (DOC) IN SHALLOW GROUNDWATER OF CKDU AFFECTED AREAS IN SRI LANKA

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Abstract: Number of Chronic Kidney Disease patients with no identifiable cause (Chronic Kidney Disease Unknown Aetiology, CKDu) are escalating in the North Central Province (NCP) of Sri Lanka. This study examined distribution of DOC in shallow groundwater of three CKDu risk zones (high risk, HR, low risk, LR and no risk, NR) and a control region (CR) from wet to dry seasons, as well as its interactions with alkaline earth metal ions and metabolites of selected pesticides. Results showed the lowest (〖COD〗 _Mn/DOC) value in HR water which indicated presence of lowest labile C with the highest aromaticity in the DOC. Four types of fluorescence DOC fractions in HR water were identified with fulvic acid component as dominant non-labile C fraction, and the essential building blocks of non-labile C were concentrated into molecular weight (MW) fraction II (900 – 1800 Da). Organic matter source in all groundwater was identified as autochthonous (fluorescence index>1.8), and pentachlorophenol (PCP) was also identified in HR water. Results of principal component analysis (PCA) showed a positive correlation between DOC and sulfate, calcium, total iron, PCP in HR groundwater. Accordingly, it can be inferred that divalent cations (Ca, Mg) abundant in HR groundwater interact with phenolate and carboxylate functional groups in DOC at alkaline pH.

Key Words: Dissolved organic carbon, hardness, sulfate, fluorescence spectroscopy, Pentachlorophenol.